SYLLABUS

1. Information regarding the programme

1.1 Higher education institution	**Babeş-Bolyai University of Cluj-Napoca**
1.2 Faculty	**Environmental Science and Engineering**
1.3 Department	**Environmental Analysis and Assessment**
1.4 Field of study	**Environmental Engineering**
1.5 Study cycle	**Bachelor**
1.6 Study programme / Qualification	**Environmental Engineering**

2. Information regarding the discipline

2.1 Name of the discipline		Transfer Phenomena and Unitary Operations in Environmental Engineering II					
2.2 Course coordinator		Conf. Dr. Ing. Nicolae Ajtai					
2.3 Seminar coordinator		Conf. Dr. Ing. Nicolae Ajtai					
2.4. Year of study	**II**	2.5 Semester	**4**	2.6. Type of evaluation	**Exam**	2.7 Type of discipline	**Compulsory**

3. Total estimated time (hours/semester of didactic activities)

3.1 Hours per week	4	Of which: 3.2 course	2	3.3 seminar/laboratory	2
3.4 Total hours in the curriculum	56	Of which: 3.5 course	28	3.6 seminar/laboratory	28
Time allotment:					hours
Learning using manual, course support, bibliography, course notes					10
Additional documentation (in libraries, on electronic platforms, field documentation)					10
Preparation for seminars/labs, homework, papers, portfolios and essays					10
Tutorship					8
Evaluations					4
Other activities:					-

3.7 Total individual study hours	42
3.8 Total hours per semester	98
3.9 Number of ECTS credits	4

4. Prerequisites (if necessary)

4.1. curriculum	N/A
4.2. competencies	N/A

5. Conditions (if necessary)

5.1. for the course	• Normal, (classic) conditions of attendance at teaching activities
5.2. for the seminar /lab activities	• Mandatory attendance at practical assignments

6. Specific competencies acquired

Professional competencies	• Definition of basic engineering concepts, concepts, theories and models and their appropriate use in professional communication • Use of basic general knowledge to explain and interpret engineering phenomena • Identification and application of concepts, methods, theories and calculation formulas for solving typical engineering problems in conditions of qualified assistance • Critical analysis and use of working principles, methods and techniques for the quantitative and qualitative evaluation of engineering processes • Application of basic concepts and theories for the development of professional projects • Explanation and interpretation of the principles and methods used in the operation of industrial processes and installations • Critical evaluation of processes, equipment, procedures and products in industry • Development of professional projects for engineering technologies • Ability to solve balance sheet problems associated with industrial processes • Ability to use the notions learned to establish the structure of an industrial process, of the technological flow, of the separation and treatment subsystems • Ability to use laboratory facilities to collect the data necessary for the preparation of process data
Transversal competencies	• Execution of the requested tasks according to the specified requirements and within the imposed deadlines, in compliance with the norms of professional ethics and moral conduct, following a work plan pre-established by the course coordinator • Solving the requested tasks in accordance with the general objectives set by individual activity or integration into a working group • Permanent information and documentation in the field • Understanding the phenomenological interdependencies taken from other disciplines and the links between them

7. Objectives of the discipline (outcome of the acquired competencies)

7.1 General objective of the discipline	• To familiarize students with the basics, concepts, theories and models in the field of environmental engineering.
7.2 Specific objective of the discipline	• Acquire basic theoretical knowledge for understanding the unitary operations that constitute the support of any industrial process • Acquire knowledge regarding the preparation of mass and energy balances • Acquire knowledge regarding the use of formulas and calculation diagrams necessary for the sizing of industrial machinery and equipment

8. Content

8.1 Course	Teaching methods	Remarks
8.1.1. Thermal pollution. Sources. General and particular causes. Consequences. Local control possibilities	Lecture Explanation Conversation	
8.1.2. Heat transfer. Basics and definitions. Temperature measurement. Natural, industrial and domestic heat sources.	Lecture Explanation Conversation	
8.1.3. Heat transmission. Total heat transfer coefficient. Thermal diagrams. Heat exchangers	Lecture Explanation Conversation	

8.1.4. Boiling, vaporization and condensation. Heat pump and air conditioning systems	Lecture Explanation Conversation	
8.1.5. Physical and chemical absorption. Absorption charts. Solvent consumption. Absorption. Operation. Sketches	Lecture Explanation Conversation	
8.1.6. Aeration. Phenomenology. Calculation of dissolved oxygen. Types of aerators	Lecture Explanation Conversation	
8.1.7. Adsorption. Phenomenology. Adsorbents. Structure of adsorbents. Static and dynamic calculation of adsorption. Adsorber. Operation. Sketches	Lecture Explanation Conversation	
8.1.8. Ion exchange. Natural and synthetic ion exchangers. Features. The cacculus of the need for materials. Apparatus. Operation. Sketches	Lecture Explanation Conversation	
8.1.9. Extraction from solid media. Drainage of granular layers	Lecture Explanation Conversation	
8.1.10. Drying of materials. Parameters that influence natural drying. Calculation of the drying time to the given humidity.	Lecture Explanation Conversation	
8.1.11. Distillation and rectification. Principles of operation. Recovery of solvents and highly volatile toxic products	Lecture Explanation Conversation	
8.1.12. Wastewater treatment by chemical processes. Procedures. Cascade treatment systems	Lecture Explanation Conversation	
8.1.13. Biological wastewater treatment. Premises. The growth curve of microorganisms. Wastewater treatment systems.	Lecture Explanation Conversation	
8.1.14. Complex equipment for the purification of liquid-solid systems	Lecture Explanation Conversation	

Bibliography:

[1] Mişca B.R.H., Manciula D.I., Ozunu Al.; Practical Work Notebook for Environmental Engineering, Cluj University Press, Cluj-Napoca; 2009

[2] Ajtai, N., Misca, B.R.H, Transfer Phenomena and Unit Operations II (course materials)

[3] Ozunu A., Mişca B.R.H.; Introduction to chemical plant design; Genesis Publishing House, Cluj - Napoca; 1995.

[4] Pavlov C.F., Romankov P.G., Noskov A.A.; Main processes and operations in the chemical industry; Exercises and problems; Technical Ed; Bucharest; 1981.

[5] Stefănescu D., Marinescu M., Dănescu Al.; Heat transfer in technology. Collection of problems for engineers; Technical Ed; Bucharest; 1982.

8.2 Seminar / laboratory	Teaching methods	Remarks

8.2.1. Heat. Types of heat. Calculation relationships. Heat balances	Problematization Mathematical model	
8.2.2. Thermal diagrams. Balances in equi- contra and multicurrent	Problematization Mathematical model	
8.2.3. Determination of the total heat transfer coefficient	Experimental Mathematical model	
8.2.4. Determination of the heat transfer surface	Experimental Mathematical model	
8.2.5. Calculation of motive forces in heat transmission.	Mathematical model	
8.2.6. Calculation of driving forces in heat transmission.	Mathematical model	
8.2.7. Calculation of driving forces in heat transmission.	Mathematical model	
8.2.8. Calculation and design of heat exchange surfaces	Mathematical model	
8.2.9. Absorption. Calculation of the required material balance	Mathematical model	
8.2.10. Absorption. Property transfer	Mathematical model	
8.2.11. Physicochemical adsorption. Determination of the minimum amount of adsorbent	Mathematical model	
8.2.12. Raising the equilibrium diagram and establishing the number of Theoretical Contact Steps	Mathematical model	
8.2.13. Drying under constant conditions.	Mathematical model	
8.2.14. Aerobic and anaerobic fermentation.	Mathematical model	

Bibliography:

[1] Mişca, B.R.H., Ajtai, N., Seminar Notebook for the Discipline Transfer Phenomena and Unit Operations in Environmental Engineering, EFES Publishing House, Cluj-Napoca, ISBN: 978-606-526-145-7, 2013

[2] Mişca B.R.H., Manciula D.I., Ozunu Al.; Practical Work Notebook for Environmental Engineering, Cluj University Press, Cluj-Napoca; 2009

[3] Ozunu A., Mişca B.R.H.; Introduction to chemical plant design; Genesis Publishing House, Cluj - Napoca; 1995.

[4] Pavlov C.F., Romankov P.G., Noskov A.A.; Main processes and operations in the chemical industry; Exercises and problems; Technical Ed; Bucharest; 1981.

[5] Stefănescu D., Marinescu M., Dănescu Al.; Heat transfer in technology. Collection of problems for engineers; Technical Ed; Bucharest; 1982.

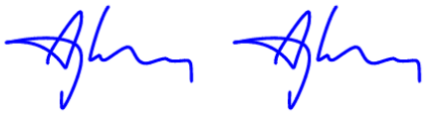
9. Corroborating the content of the discipline with the expectations of the epistemic community, professional associations and representative employers within the field of the program

By acquiring the theoretical and methodological concepts and approaching the practical aspects included in the discipline of Transfer Phenomena and Unit Operations, students acquire a consistent knowledge in accordance with the partial skills required for the possible occupations provided in Grid 1 – RNCIS

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course + Seminar + Laboratory	Correctness of answers – correct acquisition and understanding of the issues dealt with in the course Correct solutions for the presented problem.	Written exam – access to the exam is conditioned by the completion of seminar and laboratory activities	100%
10.6 Minimum performance standards			
• Grade 5 (five) the examination • Knowledge of the introductory notions, of the phenomenology of the processes, the sketches of the equipments, the minimum description of the mode of operation			

Date | Signature of course coordinator | Signature of seminar coordinator



15.11.2024

Date of approval | Signature of the head of department